METALLIC FORMWORK SYSTEM FOR MOLDING CONCRETE

FIELD OF THE INVENTION

The present invention relates to a metallic formwork used for molding concrete in construction works and substructures. Specifically, the invention is easily operated and suitable for many uses within a modular environment that allows interconnection through a range of metallic accessories. More specifically, these metallic formworks are modules formed from steel sheets with reinforcements having dimensions according to any desired requirements. The formworks of the present invention are selectively positioned and interconnected adjacent to each other to selectively shape concrete in walls or partition walls.

The formwork of the present invention is made from steel sheets (2mm to 3mm thick) and the modules formed therefrom can have a weight of up to 43 kg and dimensions varying from 5cm to 80cm in width and 20cm to 240cm in height, with increasing scales of 5cm among different sizes.

SUMMARY OF THE INVENTION

The metallic formwork of the present invention is a lightweight, portable and easy to use system. The basic module of the system is designed to weight not more than 25 Kg, although modules having dimensions of 240 cm X 60 cm can weight up to 43 kg and still be easily handled by any person.

According to an aspect of the invention, the metallic formwork modules provide a visible smooth finish or texture to the concrete walls.

According to another aspect of the invention, the metallic formwork modules can be built in different sizes with different measurements to provide irregular-sized modules when needed.

In accordance to a further aspect of the invention, the metallic formwork modules are manually installed without the need of expensive and heavy equipment and crane towers.

According to one aspect of the invention, the system is easily transported to the construction site due to its box-like configuration.

According to an aspect of the invention, the metallic formwork modules are designed in accordance to earthquake resistant regulations.

According to a further aspect of the invention, the system avoids unwanted waste materials and debris.

According to another aspect of the invention, the system allows controlling the use of construction tools and materials.

According to a still further aspect of the invention, the system is designed to be re-used due to its metallic construction.

In accordance to an aspect of the invention, the metallic formwork system reduces construction costs and storage space.

According to another aspect of the invention, the versatility of the system allows it to be used in residential and commercial sites.

According to one aspect of the invention, the metallic formwork modules can be easily washed and cleaned after being used.

BRIED DESCRIPTION OF THE DRAWINGS

These and other aspects and advantages of the formwork of the present invention are more apparent from the following detailed description and claims, particularly when considered in conjunction with the accompanying drawings, in which:

Figure 1 shows the basic arrangement of the metallic modules forming the formwork according to the invention;

Figure 2 shows an L-shaped angular metallic accessory that allows external turn between adjacent modules according to the invention;

Figure 3 shows a corner cupboard-type box accessory that allows internal turn between adjacent modules according to the invention;

Figure 4 (a-e) shows a plurality of metallic accessories used to assemble the formwork according to the invention;

Figure 5 shows an exemplary formwork arrangement having formwork modules in parallel according to the invention;

Figure 6 shows formwork modules in parallel separated by a distancing element according to the invention;

Figure 7 shows a formwork module aligning arrangement according to the invention;

Figure 8 shows a joining element securing adjacent formwork modules according to the invention;

Figure 9 shows a formwork module having V-shaped reinforcing metallic elements according to the invention;

Figure 10 shows a perspective view of a formwork module's back surface having V-shaped reinforcing metallic elements according to the invention;

Figure 11 shows another perspective view of a formwork module's front flat surface according to the invention; and

Figure 12 shows a fixed securing element according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 shows a metallic formwork arrangement according to the present invention. A modular frame **10** comprises a rectangular-shaped steel sheet **11** longitudinally surrounded on its sides by metallic side members **12** and on its top and bottom sides by metallic top and bottom members **13**, respectively as shown in **Figure 11.** Angular cuts are formed at the corners of said modular frame **10** where an end of a metallic side member **12** meets an end of a metallic member **13** as shown in **Figures 1, 5** and **6.**

Each metallic side member **12** comprises a plurality of equally spaced holes **14** across its length. The modular frame **10** is reinforced with V-shaped metallic reinforcing elements **15** extending from the top side to the bottom side

as shown in **Figure 9.** It is further reinforced with struts **16** longitudinally extending from side to side and perpendicular to said V-shaped metallic reinforcing elements **15** as shown in **Figures 1** and **10.**

Figure 2 shows an L-shaped angular accessory **17** having an angular profile. This accessory acts as a coupling element that allows angular interconnection between external formwork modules to form concrete corners as shown in **Figure 1.** L-shaped accessory **17** is a metallic accessory having the same length as the formwork module **10** and also comprises a plurality of equally spaced holes on its sides and distributed across its length.

Figure 3 shows another metallic formwork accessory of the present invention. An internal corner element **28** comprises a box-type metallic frame that allows angular interconnection between internal formwork modules to form concrete corners as shown in **Figure 1.** The corner element **28** has metallic walls **29** and **30** comprising a plurality of equally spaced holes on its surfaces and distributed across its length to facilitate passage of pins as will be shown later.

The metallic formwork arrangement of the invention comprises formwork modules connected in parallel and having a distance e between the parallel-connected modules as shown in **Figure 5,** where the space provided by distance e is filled with concrete to form walls or partition walls in a building or structure. These parallel-connected modules are coupled and secured to each other by distancing elements **18** shown in **Figure 4c,** made of metallic sheet from 5 cm to 120 cm and having on its ends holes **10** (10 mm

diameter) that allow tight passage of a rod-shaped hook or pin **20** having an angular folded end as shown in **Figure 4b.** As previously mentioned, this distancing element **18** selectively regulates the space between two parallel-connected modules.

Once two modules are installed, an alignment element **21** comprising a metallic U-shaped element of variable length is provided to vertically align the modules and provide structural stability and rigidity to the same as shown in **Figures 4d** and **5.** A U-shaped gripping press **22** shown in **Figure 4e,** is used to longitudinally secure said alignment element **21** against the width of said metallic formwork modules as illustrated in **Figures 1** and **5.** The gripping press **22** comprises a manually-rotated screw **23** structurally coupled to said press **22** and a pair of metallic hooks **24** extending away from said gripping press **22** as shown in **Figure 4e.** In operation, the U-shaped alignment element **21** is placed inside the U-shaped gripping press **22** and then hooks **24** are inserted into holes **14** provided on metallic side members **12.** When the screw **23** is rotated, alignment element **21** is pressed against the metallic formwork modules as shown in **Figures 1, 5** and **7.**

Laterally-adjacent modules are complementary secured to each other by a linking element **25** shown in **Figure 4a,** comprising a rectangular metallic sheet having an axial receiving slot. The linking element **25** has an angular folding configuration and further comprises a welded rod **27** having a folded end. When two modules are positioned side-by-side, their respective metallic side members **12** being in close proximity to each other are inserted into the axial

receiving slot and rod **27** is inserted into holes **14** to secure the modules against each other as shown in **Figure 8.**

As shown in **Figures 1, 5, 6** and **12,** a locking element **40** is fixedly provided on the corners of the formwork modules for receiving and securing a pin **20** used to secure the distancing element **18** to said formwork modules. Specifically, the locking element **40** is provided with a slot for receiving and latching a folded end of said pin **20.** The other end of pin 20 is simultaneously inserted into hole **19** of said distancing element **18** and hole **14** of said side member **12** as shown in **Figure 6.** This locking arrangement ensures that the concrete remains inside the parallel-connected formwork modules when the concrete is being molded.

The metallic formwork modules of the present invention can be manually installed in accordance to the following general steps:

1. Apply a demoulding material to the surfaces of the modules;

2. Assemble the formwork modules in accordance with the construction requirements;

3. Install and secure the L-shaped angular accessory **17** to adjacent modules as needed;

4. Install the linking elements **25** ensuring the metallic side members **12** are inserted into the axial receiving slot and that rod **27** is inserted into holes **14** to secure the modules against each other;

5. Install the distancing elements **18** to position the formwork modules in parallel by inserting one end of pin **20** into holes **19** of the distancing elements and securing the other end of the pin **20** with the locking element **40**; and

6. Adjusting alignment element **21** against the formwork modules with the gripping press **22** to vertically align the modules and provide structural stability and rigidity to the same prior to pouring the concrete into the parallel-connected formwork modules arrangement.

The flat surfaces of the metallic formwork modules are coated with a demoulding material prior to pouring the concrete to prevent said concrete from adhering to said flat surfaces. The surfaces are easily pressure-washed once the concrete filing process is finished.

The rigidity and integrity of the system is ensured by the installation of pins into the appropriate holes provided for securing the distancing elements to the modules.

These modules can be made in sizes of 240 cm in height and from 5 to 80 cm in width. The internal corner modules and the L-shaped angular accessories can have lengths of from 20 to 240 cm. The formwork module's weight based on the selected dimensions can very from 3 kg (5 X 120 cm) to 43 kg (60 X 240 cm).

Because many varying and differing embodiments maybe made within the scope of the inventive concept herein taught and because many modifications may be made in the embodiment herein detailed in accordance with the descriptive

requirement of the law, it is to be understood that the details herein are to be interpreted as illustrative and not in a limiting sense.